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ABSTRACT

The purpose of the project was to determine to what extent visual, motor, and perceptual training would improve the reading and general achievement of children with visual, motor, and perceptual deficiencies. Eighty first, second, and third graders, identified as having such handicaps by gross and fine screening instruments, were randomly divided into experimental and control groups. For 1/2 hour per day for six months, training exercises and activities were conducted in the following categories: ocular motor, movement skills, laterality and directionality, spatial judgments, eye-hand coordination, and visualization. Post-tests administered were the Fine Screening Instrument, Lorge-Thorndike IQ Test, Gates-McGinitie Reading Test, and Stanford Achievement Test. The IQ and Achievement Tests showed no gains of the experimental group over the control group. But the fine screening results showed more improvement in visual-motor-perceptual functioning by the experimental group, and anecdotal records by classroom teachers reported progress by nearly all the experimental students. (KW)

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Principal Investigator

Ticknor B. Litchfield, Ed. D.
Assistant Superintendent for Curriculum

Ramapo Central School District No. 1
Suffern, New York

July 1970

FINAL REPORT

New York State Experimental and Innovative Programs
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Ramapo Central School District No. 1
Suffern, New York

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Dr. Jerome Lipovsky
Dr. Bernard Paley

Research Consultant

Dr. Francis G. Cornell

School Administrators

Miss Anna Williams - Director of Elementary Education
Mr. Joseph Smith - Assistant Director of Elementary Education
Mr. Richard Connor - Principal, Cypress Road School
Mr. William Weaver - Principal, Montebello Road School

School Psychologists

William Lathrop
Dr. David Koplon
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Most of the faculty in both of the schools participated in some degree with interest and enthusiasm in the project. This involved inservice education, workshop and instructional sessions as well as informal conferences with the visual training teachers. Teachers included regular classroom teachers, reading teachers, nurse-teachers, helping teachers and speech therapists. To them, gratitude and appreciation is due.

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A B S T R A C T

A. TITLE

A Program of Visual-Motor-Perceptual Training to Determine Its Effects Upon Primary Level Children With Reading and Learning Deficiencies

B. PRINCIPAL INVESTIGATOR

Dr. Ticknor B. Litchfield
Assistant Superintendent for Curriculum

C. DATE

July, 1970

D. IMPLEMENTING AGENCY

Ramapo Central School District No. 1
Suffern, New York

E. STATEMENT OF THE PROBLEM

Clinical evidence has pointed to the importance of visual, motor and perceptual bases for academic achievement and the relationship between deficiencies in these areas and underachievement. The use of methods and techniques for correction and development of visual, motor and perceptual difficulties within a school setting may alleviate underachievement difficulties and assist in overcoming the need for much of the remedial and compensatory training in schools today.

The major purpose and hypothesis of this experimental project was to determine the extent to which visual, motor and perceptual training would improve the reading and general achievement of primary level children with visual, motor and perceptual deficiencies.

F. METHODS USED

Eighty children of two schools in first, second and third grades were identified as having visual-motor-perceptual handicaps which may be affecting their academic performance. They were identified using a Gross Screening Instrument of 16 checklist items filled out by classroom teachers, and by a Fine Screening Instrument used by optometric consultants. The

80 children were randomly placed into experimental and control groups. Pre-testing consisted of the Lorge-Thorndike I.Q. Test for all grades, the Metropolitan Readiness Test for grade 1, and the Gates-McGinitie Reading Test and Stanford Achievement Test for grades 2 and 3.

In each of the schools, three training groups were established made up of six to eight children each. Training took place for six months, from November, 1969 to May, 1970. The groups met daily for one-half hour periods. Exercises and activities varied according to individual deficiency and progressed from simple to more sophisticated variations. Training exercises and activities were divided into six major categories as follows: ocular motor; movement skills, including balance, one-sided movement, alternate movement, and reciprocal movement; laterality and directionality; spatial judgments; eye-hand coordination; and, visualization.

Post-testing was completed at all three grade levels using Fine Screening, Lorge-Thorndike I.Q. Test, Gates-McGinitie Reading Test, and the Stanford Achievement Test.

G. RESULTS OBTAINED

1. Gross Screen Analysis

An item analysis using a t-Test and biserial correlation was conducted on the results of the Gross Screening Instrument. Although all items contributed significantly to the total score, some of the items were more important than others. There was a significant correlation between results of the Gross Screening Instrument and Fine Screening Instrument.

2. Fine Screen Analysis

There was found to be no significant difference between the experimental and control groups on the basis of pre-fine screening. The post fine screening mean score of the experimental group was significantly higher at the .01 level than the mean score of the control group, using analysis of variance. Although the gains of the experimental group were greater than the control group from pre- to post-fine screening, these gains were not found to be significant. Clear cut differences by grade level and sex were not indicated.

3. I.Q. and Achievement Test Results

Results of the Lorge-Thorndike I.Q. Test, Stanford Achievement Test, and Gates-McGinitie Reading Test do not indicate any gains of the experimental group over the control group. It would appear that the achievement tests and reading tests used were not appropriate for measuring the experimental program.

4. Anecdotal Records by Classroom Teachers

Almost all classroom teachers who had children participating in the experimental group of the project felt that their students made remarkable progress as a result of the program. This was ascertained by a questionnaire administered to teachers at the conclusion of the project.

H. DISCUSSION

The Gross Screening Instrument was found to be a useful tool for teacher use in the detection of students with possible visual-motor-perceptual handicaps. It is simple to use and easy to administer. On the basis of fine screening results more improvement was shown in visual-motor-perceptual functioning by the experimental group than by the control group.

The lack of gains on I.Q. and achievement tests between the experimental group and the control group may be due to several factors. The experimental period was of short duration and training was for only one-half hour per day. There were variations in the control of students in the project in special areas of instruction, such as remedial reading. The training emphasis in the experimental project was primarily physical in nature. The testing program, except relating to the fine screening, did not directly measure facets for which training was being given.

It is considered that the project was a success and that there were improvements shown in students participating in the experimental program. It is recommended that visual-motor-perceptual programs continue in our school district in a variety of different settings.

I. INTRODUCTION

A. Statement of the Problem

For many years in education, beginning at the elementary levels, attempts have been made to overcome learning deficiencies in children by remedial assistance in the area in which the child was having difficulty. Remedial treatment has been helpful in some cases but in many instances its effects have been disappointing. Many teachers and clinicians have noticed what might be a relationship between learning and reading deficiencies and visual-motor-perceptual dysfunction. This observation has been made in Ramapo Central School District No. 1, as well as in other educational settings throughout the nation.

Educators are generally ill-equiped to overcome deficiencies in motor-perceptual or visual functioning and, as a result, have overlooked, to a large extent, such problems in the school setting or treated them with the usual remedial-type of instruction.

A project attempting to deal with these visual-perceptual-motor deficiencies in young children through training exercises was conducted in Ramapo Central School District No. 1 during the 1969-70 school year. It is anticipated that as a result of the project there will be implications for modification of primary school programs.

During the Spring of 1969, Ramapo Central School District No. 1 offered an inservice education course to teachers and professional personnel entitled, "An Optometric Approach to Aiding Children With Visual Problems Related to Learning Problems." The Bureau of Inservice Education of the State Education Department shared the expense of this course. The course was very well received. Sixty teachers in the school system applied for admission to the course; this represented 20 percent of the total professional staff. The high interest seemed to have been indicative of the importance of the course in the eyes of the teachers. Thirty-two members of the professional staff were admitted to and completed the course. The course was taught by seven doctors of optometry, four of whom are members of the staff of the Optometric Center of New York and all are practicing optometrists in New York State.

The course was considered to be a sound contribution for setting a proper foundation for the experimental program which followed during the 1969-70 school year. Citizens, Board of Education members, administrators and teachers have expressed interest and enthusiasm in the inservice course and the research project which followed.

The major purpose and hypothesis of this experimental project was to determine the extent to which visual, motor and perceptual training would improve the reading and general achievement of primary level children with visual, motor and perceptual deficiencies.

B. Review of the Literature

Numerous studies of a clinical nature and case studies have been conducted which point to a relationship between visual-motor-perceptual dysfunction and reading and learning deficiencies. Among the organizations conducting such studies are the Gesell Institute of Child Development, The Optometric Extension Foundation, and the Optometric Center of New York. These studies have been largely observational in nature and little in the way of applied research in an educational setting has been conducted. Several projects similar to that reported herein are being conducted currently here in New York State.

According to Rouse (34), an abundance of research material published in the past few years by members of various disciplines concerning disabilities overwhelmingly indicates a positive relationship between vision and learning. On the other hand, Govatos (19) has said that much of the research on motor learning of interest to educators has not been a well organized effort. Kephart (23) has stated that many children are entering school lacking the basic readiness skills essential for the optimal learning of high-level cognitive skills, such as reading and writing. These readiness skills are essentially perceptual-motor skills. There is need for training to develop these skills. This position has also been put forward by Delacato and Frostig. Frostig's (17) description and analysis of five areas of visual perception include space, space relationships, perceptual constancy, visual-motor coordination, and figure-ground perception. These areas correlate readily with those used by the optometrists in the fine screening instrument used in this project. Ellingson (14) says that perception is the key to reading.

Crawford (7) expresses the feeling that children have trudged through our educational system for years both misjudged and mislabeled. He stresses the need for an increased awareness on the part of teachers to spot these children and innovate means of dealing with the mislabeled "mentally retarded." The Winter Haven Lions Research Foundation (9) has also published a testing and training manual. They have derived these techniques through research done at the Institute. Their assumption is based upon the fact that psychologists tell us that perceptual situations and skills are learned. Hence, there is a need for testing and training in this field for children with perceptual difficulties.

Barsch (2) states that the spatially naive child who has trouble locating one foot in relation to the other when walking obviously will have difficulty achieving security. One of the most profound gains in the current study herein reported was found in the change of attitudes. The psychological and environmental implications cannot be measured on any scale and have no statistical value. deHirsh, Jansky, and Langford (10) place considerable emphasis on the need for prompt identification of those children destined to fail in reading. They keynote this by saying that poor readers have trouble primarily with the process of information received through visual pathways and disturbances in spatial organization. This too was a premise for the current study and supported the attempt to develop an instrument for identification, in addition to clinical diagnosis.

Ilg and Ames (22) give primary attention to developmental expressions of age. In their research, they have recognized the recurrent comparable expression of developmental age. The child who is perceptually involved must be taken from his specific developmental stage, rather than chronological age. This was incorporated in the current study by way of cross-grade grouping.

Mullins (28) says that the educational literature includes some explicit support for the principal and practice of visual training for the child who has marginal learning problems. Notwithstanding the logical arguments and documented successes of its adherents, there is great difficulty in establishing adequately controlled research relating visual factors and learning problems. References are also made to Ilg, Ames, Gelman, Kane, Halgren, McKee, Rosner, and Flax.

Among more recent research projects in this area, the following examples might be cited. Flax (16) has examined the role of vision in a seriously retarded reader. Acuity and refractive error did not seem to be related to reading retardation. Impairment of visual skills such as fusion and accommodation can contribute but are not primary, he stated. Other visual functions such as form perception, visuo-motor control and ability to match visual and verbal configurations may be more closely related. Even more recently, Lewis (26) has described a pilot program initiated to determine if a specific type of therapy could be instrumental in improving perceptual ability as reflected in reading achievement. Improvement in each area of visual perception was noted but due to the limited number of subjects the mean gains after therapy were not statistically significant except in eye-motor control. And most recently, McCormick, Schnobrich and Footlik (27) submitted first grade children who were reading initially below grade level to perceptual-motor training. Clear and significantly larger gains in reading achievement were achieved by the experimental group over the control group but there were no differences cited in the total first grade population. They cited the limited size of their sample as a drawback of the study.

In New York State public schools, there are several projects on visual-motor-perceptual deficiencies currently underway. These have been studied in the current program. The Peru Central School District (5, 23, 32) undertook a three-year project in perceptual-motor education. After testing with the Frostig Test of Visual Perception they found that of their 160 kindergarten children, 60 percent fell below acceptable norms for adequate visual perception. This program includes a preventive program in kindergarten and grade 1 for all children and a remedial program for grades 2 through 6 for those displaying definite lag in perceptual-motor development.

The hypothesis set forth by the Perceptual-Sensory Project of the Westchester B.O.C.E.S. No. 1 included similar objectives to the current study. During 1968, they attempted to remediate learning difficulties of first grade children by using a learning model based upon three major sensory areas that are significant in the learning process. These included auditory, visual and tactile kinesthetic. A multifactor test battery, along with teacher screening, were used to

identify learning difficulties. After remediation the pre-test, post-test correlation was significant enough to merit continuation of the project for another year.

The above examples and others not cited show that visual-perceptual-motor training of young children to improve reading and learning achievement has promise for future educational programs.

C. Objectives or Hypotheses

The following statements describe the hypotheses which were tested and, hence, were considered the objectives of the study. They served as guides throughout the research project.

1. The extent to which visual-motor-perceptual training will affect a primary grade level child's reading achievement, general achievement, intelligence and visual functioning.

2. The differences in gains in reading, general achievement, intelligence and visual functioning at the conclusion of visual-motor-perceptual training, by the following:

   a. Total experimental group, total control group

   b. Grade 1, grade 2, grade 3

   c. Male, female

   d. Grade 1 male, grade 2 male, grade 3 male

   e. Grade 1 female, grade 2 female, grade 3 female

3. To determine the effectiveness of screening procedures by determining achievement gains of subjects in control group and experimental group.

II. METHODS OR PROCEDURES

A. Subjects Involved in the Investigation

Eighty students in grades 1, 2, and 3 of the Cypress Road and Montebello Road Schools were involved

in the investigation. In each of the schools, 40 subjects were used. Twenty of these were in the control group and 20, approximately, were in the experimental group. Participants in the experimental and control groups were determined using a table of random numbers. These were equally divided among grades 1, 2, and 3. Generally, there were about two-thirds of the subjects boys and one-third girls. A table of the subjects involved in the investigation is below. These represent students who completed the program. It is to be noted that there were several dropouts during the year due to migration of students.

Table 1

SUBJECTS INVOLVED IN THE INVESTIGATION

School and Group	Grade 1		Grade 2		Grade 3		Total
	Boys	Girls	Boys	Girls	Boys	Girls	
Cypress Road							
Experimental	4	3	3	3	6	2	21
Control	4	3	4	3	5	2	21
Sub-Total	8	6	7	6	11	4	42
Montebello Road							
Experimental	3	3	5	2	5	2	20
Control	5	2	5	2	4	2	20
Sub-Total	8	5	10	4	9	4	40
TOTAL	16	11	17	10	20	8	82

These subjects were selected using a Gross Screening Instrument, as well as fine screening performed by optometrists on the basis of the gross screening results completed by teachers. The optometrists performed fine screening on approximately 120 children based upon the number of negatively scored items on the Gross Screening Instrument. Eighty of these were selected on the basis of severity of deficiency on the fine screening procedure.

Members of the experimental group in each of the two schools were divided into three groups to receive training. These students were divided into the three

groups to receive training. These students were divided into the three groups in accordance with the severity of their visual-motor-perceptual dysfunction. In general terms, these three groups were categorized as: ocular-motor, laterality and directionality, and form and size. There were six to eight students in each group. In some instances, there was a coincidence between these dysfunctions and grade level but not in all instances.

Each of the groups in both schools received one-half hour of training daily from the period of November 24, 1969 to May 15, 1970. This was approximately 100 days of instruction or 50 hours for each student.

B. Educational Treatment or Activities

Instruction was provided by a visual training teacher. This teacher had primary level classroom teaching experience and was specially trained for this project. The two optometric consultants were available to assist in class sessions for an average of one and one-half days per week during the entire project. A familiarization workshop was held in August, 1969 for selected teachers of both schools. Faculty meetings to explain the project and use of the Gross Screening Instrument were conducted during the first several days of school in each school.

The educational treatments or activities involved in this project fall into six broad categories which are: ocular-motor, movement skills, laterality and directionality, spatial judgments, eye-hand coordination, and visualization. Each of the activities in the six major areas were designed to overcome disabilities of the students and relate to the areas of fine screening. Prior to the beginning of training sessions, the optometrists and the visual training teacher reviewed each child's optometric fine screening score. At this point their purpose was for grouping of the experimental children. Children were grouped according to scores in areas of the fine screening, and instruction was individually prescribed accordingly. Continual evaluation of the children was made during the project and changes in instruction were made in accordance with these reassessments. An outline of the various activities used under the major categories is below. Detailed sample activities appear in Appendix A.

1. Ocular-Motor Activities

Ocular-motor control is defined as the ability to control eye movement. This includes the capacity of the organism to fixate accurately on a target at near, mid and far points in space, to scan a surrounding for meaning in all directions on the vertical and horizontal planes and to thus steer the body in proper alignment for movements through space. Among some of the activities involved under this category are as follows:

a. Marsden Ball (See Appendix A)
b. Eight-Pointed Star
c. Chalkboard Saccadics
d. Follow the Line
e. Mid-line

2. Movement Skills

Under the category of movement skills, there are three areas to which attention has been given. These are bilateral movements, gross motor patterns and fine motor patterns. Bilaterality is the capacity of the organism to reciprocally interweave two sides in a balanced relationship of thrusting and counterthrusting patterns around three coordinates of vertical, horizontal and depth in proper alignment from initiation to completion of a task. Gross motor body movements involve large muscles; whereas, fine motor movements involve small muscles of the body. Various activities used in overcoming dysfunctions in this area are listed below:

a. Balance Activities
   - o Rolling
   - o Sit-ups and leg lifts
   - o Walking Beam (See Appendix A)
   - o Balance Board
   - o Balancing on one foot
   - o Stiff leg stand

b. Bilateral Movement -- as defined above, includes activities which involve movement of both sides of the body in a balanced relationship. Included among the activities in bilateral movement are the following:
   - o Teams
   - o Jumping

- Ball Bounce and Throwing
- Windshield Wipers (See Appendix A)
- Bilateral Reading and Movement
- Simon Says Movements
- Heels and Toes-Apart-Together
- Jumping Jacks
- Jumping Rope

c. One-sided Movement -- or homolateral movement is movement of only one side of the body at a particular time. This relates to dynamic balance and the individual's body awareness in space. Activities conducted under this category are:
   - Chalkboard Cat and Mouse
   - Chalkboard Windshield Wipers
   - Ball Bouncing
   - Hopping
   - One-sided Blackboard Movement (See Appendix A)

d. Alternate Movement -- relates to the movement of different sides of the body within an alternate pattern and as related to dynamic balance and body awareness in space. Included in the activities under alternate movement are:
   - Teams
   - Ball Bouncing
   - Around the Bases
   - Alternate Hopping
   - Arm and Leg Swing
   - Alternate Arm Jumping Jacks (See Appendix A)

e. Reciprocal Movement -- is defined as body movement with the movement on the right side corresponding with body movement on the left. Many of the activities of reciprocal movement listed below are similar to those found under bilateral movement or alternate movement. The only difference is that both hands or feet are required to do the same thing or move in the same direction. The following is a list of activities for reciprocal movement.
   - Teams (See Appendix A)
   - Ball Bounce With Feet Swing
   - Hand, Eye and Feet Pointing
   - Windshield Wipers
   - Geometric Forms
   - Reading and Movement

- o Simon Says
- o Skipping
- o Follow the Leader
- o Monster Walk

3. Laterality and Directionality

Laterality is defined as a sense of orientation or an awareness of direction, such as up-down and left-right. This is a posture in which a person has equilibrium with gravity. Directionality, on the other hand, is a projection outward of laterality and enables an individual to realize equilibrium with his environment. Activities and exercises in laterality and directionality used in the project are listed below.

a. Lines and Directions
b. Lines in Eight Directions (See Appendix A)
c. Maze
d. Identification on Chalkboard
e. Ball Stop
f. Dodge Marsden Ball
g. Concept of Backwards
h. Chalkboard Angels
i. Series of Steps in Eight Directions
j. Facing and Predicting
k. Forced Reversals
l. Cut Arrows
m. The Dubnoff School Program

4. Spatial Judgment

Spatial judgment is the ability of the individual to make spatial relationships, distance judgments and size and form discrimination. Among the activities in this project used to develop skills in spatial judgments are:

a. Jumping Between Two Points
b. Visual Measurements of Distance
c. Map Game
d. Baseball Game
e. Around-the-Room-Game
f. Parquetry Routine (See Appendix A)
g. Paper Folding
h. Shap-o
i. Build-o-form
j. Shapes-Recognition and Discrimination
k. Spatial Orientation Exercises

l. Constancy of Form and Size Exercises
m. Spatial Relations Exercises
n. Perceptual Motor Exercises
o. Perceptual Bingo

5. Eye-Hand Coordination

Eye-hand coordination, as its name implies, is the ability of the child to coordinate activities of the eyes and the hands in a proper fashion. Among the activities in eye-hand coordination which were used in the project are:

a. Squiggly Lines
b. Clock Arithmetic
c. Clock Spelling
d. Checkerboard Tapping
e. Rotating Peg Board (See Appendix A)
f. Coloring in Letters
g. Tracing
h. Templates
i. Marsden Ball
j. Cutting Exercises
k. Coloring Exercises
l. Across the River
m. Bean Bag Toss
n. Group Bean Bag Toss
o. Line Exercises

6. Visualization

Visualization is described as the ability of an individual to picture an image in his mind. This includes the development of visual memory or recall. Among the activities used in the project under the category of visualization are:

a. Tachistoscopic Tic-Tac-Toe
b. Flash-X
c. Memory Tic-Tac-Toe
d. Visual Tic-Tac-Toe
e. Coding
f. Visualizing Line Length
g. Dominoes
h. Make-a-Word
i. Grid-Spelling
j. Hangman
k. Remember the Object
l. Figure-Ground Discrimination Exercises
m. Visual Tracking

n. Symbol Tracking
o. Handwriting with Write and See

C. Instruments Used

In this visual-motor-perceptual training project, different instruments were used to ascertain dysfunction and also to determine intelligence and achievement levels prior to the experimental period and following the period. Some of these instruments were locally conceived or adapted; the achievement and intelligence tests were commercially obtained. In outline form, the instruments used are described below.

1. Gross Screening Instrument

The optometric consultants developed a Gross Screening Instrument using a number of different resources. This instrument is a simple 16-item checklist for teachers to initially screen students for possible visual-motor-perception handicaps. A three point scale of +, 0, - was used for scoring. This instrument was administered during the first two weeks of school in September, 1969 by all teachers in grades 1, 2, and 3 of both the Cypress Road and Montebello Road Schools.

Many of the teachers, at that time, indicated that they did not know their students sufficiently well enough during the first two weeks of school to adequately evaluate them on the Gross Screening Instrument. Hence, several months later, the instrument was reapplied by the same teachers to the same students. During both applications, the teachers were consistent in their evaluation of students, indicating that the teacher can evaluate a student using this instrument during the first several weeks of school. See Appendix B for a copy of the Gross Screening Instrument, and Appendix C for a copy of a Class Visual Screening Summary.

2. Fine Screening Instrument and Scoring Criteria

The optometrists also developed a Fine Screening Instrument and Scoring Device. This is the instrument that the optometrists used in their fine screening of students whom teachers felt should be screened more carefully as potential subjects for the experiment. A pre-experiment score was obtained for all students on the Fine Screening In-

strument, both the control group students and the experimental group. Following the experimental period, there was a reapplication of the Fine Screening Instrument to all students in the experimental and control groups. A copy of the Fine Screening Instrument and Scoring Criteria can be found in Appendixes D and E respectively.

3. Lorge-Thorndike Intelligence Test

In grades 1, 2, and 3, the Lorge-Thorndike Intelligence Test, of the appropriate level, was used. This was administered pre- and post-experimental period.

4. Gates-McGinitie Reading Test

The Gates-McGinitie Reading Test was administered as a pre- and post-test to experimental and control groups in grades 2 and 3. Post-testing, using Gates-McGinitie, was used in Grade 1. Different forms were used for pre- and post-testing.

5. Metropolitan Readiness Test

The Metropolitan Readiness Test was administered as a pre-test to grade 1 students in the control and experimental group.

6. Stanford Achievement Test

Selected sub-tests of the Stanford Achievement Test were used for pre- and post-testing in grade 2 and grade 3 and for the post-test in grade 1. Different forms were used for pre- and post-testing. Those sub-tests used of the Stanford Achievement were as follows:

- Grade 1
  Word Meaning
  Paragraph Meaning
  Spelling
  Word Study
  Vocabulary

- Grades 2 and 3
  Word Meaning
  Paragraph Meaning
  Spelling
  Word Study
  Language

The sub-tests of social studies and arithmetic were eliminated because of their lack of relationship to the project and also in the interests of time for administering the tests.

D. Technical Description of Procedures Used for Data Analysis

1. Gross Screening Instrument

An item analysis of the items on the Gross Screening Instrument was made using a t-Test to determine the significance of difference of means between plus and minus scores on each item with the total minus score. In addition, biserial correlation coefficients were computed for each of the 16 gross screening items. This was done to determine the degree to which each item validates the total score of the Gross Screening Instrument.

A correlation coefficient was computed between the Gross Screening Instrument results and the Fine Screening results. This was done using the pre-fine screening results and the first and second applications of the Gross Screening Instrument.

Frequency Distributions of Negative Scores and Negative Score Item Frequencies were tabulated on the results of the Gross Screening Instrument by each school and combined for each of the applications of the Instrument. This is reported in Appendixes F, G, H, and I.

2. Fine Screening Instrument

The significance of difference between the experimental and control groups on the pre-Fine Screening Instrument was determined. Correlations were computed between the fine screening results and Lorge-Thorndike I.Q. Tests as well as Stanford Achievement Test Median results. The significance of difference in fine screen scoring between the two optometrists was determined on the pre-fine screening and the post-fine screening. Gains in pre- and post-fine screening were determined and tested for significance, and an analysis of variance of post-fine screen results by groups and examiners was completed.

3. I.Q. and Achievement Tests

The significance of gains between the experimental and control groups on the Lorge-Thorndike I.Q. Test, the Stanford Achievement Test, and the Gates-McGinitie Reading Test were to be determined using t-Tests, analysis of co-variance, and multivariate analysis. Simple comparisons between the groups, however, showed little or no difference in gains between the experimental and control groups. Hence, thorough analysis of the data using procedures originally contemplated was not made.

III. RESULTS: VERBAL AND TABULAR PRESENTATION OF RESULTS OF THE ANALYSES

A. Gross Screen Analysis

The results of the t-Tests and biserial correlations used in item analysis of the Gross Screening Instrument are reported in Table 2. An analysis of these tests show that although all items on the Gross Screening Instrument contribute significantly toward the final score, some carry heavier loads than others indicating that they contribute more towards the final score than other items. Those items which appear to add most to the final score are as follows:

- 4. Is generally well coordinated.
- 7. Exhibits acceptable performance at block play.
- 9. Has no difficulty copying from the chalkboard.
- 11. Can maintain balance on either foot for a minimum of ten hops.
- 12. Can hop on either foot for a minimum of five hops.
- 14. Exhibits no tendency to turn or twist body on paper and pencil tasks.
- 15. Exhibits no tendency to twist paper on paper tasks.

These results would indicate that the seven items listed may take priority over other items in determining

Table 2

BISERIAL CORRELATION COEFFICIENTS AND t-TEST RESULTS
OF ITEMS IN SEPTEMBER GROSS SCREENING INSTRUMENT
WITH TOTAL NEGATIVE SCORE,
82 EXPERIMENTAL AND CONTROL STUDENTS

Item No.	r_{bis}	t
1	.4122	2.96
2	.4976	3.73
3	.4632	4.05
4	.7300	6.14
5	.4023	3.43
6	.4779	3.57
7	.7472	4.01
8	.5326	3.88
9	.6562	5.56
10	.6082	3.98
11	.6417	4.73
12	.6641	5.24
13	.4030	3.75
14	.7292	6.18
15	.7696	6.67
16	.5275	2.87

visual-motor-perceptual handicaps of children as determined by teachers on a Gross Screening Instrument.

Correlation Coefficients were computed with the fine screening scores using the first gross screening scores and the second gross screening scores. It will be remembered that the first Gross Screening Instrument was applied in September, 1969 and as a result of many teacher requests, because of their lack of knowledge of children during the first few weeks of school, the Instrument was reapplied in December of 1969. Both results of these gross screenings were correlated with the pre-fine screening results, the instrument administered by the optometric consultants, with the following results.

Table 3

CORRELATION COEFFICIENTS BETWEEN GROSS SCREEN AND FINE SCREEN RESULTS

	Pre-Fine Screen
1st Gross Screen	-.2804 *
2nd Gross Screen	-.2726 *

* Significant at .05 level; .01 level, one-tailed.

The results show a significant correlation between both the first and second gross screening results and the pre-fine screening at the five percent level or at the one percent level using a one-tailed procedure. However, as validity coefficients these correlations do not show a high level of relationship between teachers' judgments and more precise measurement. Correlations are naturally negative because a high numbered score on the gross screening and a low numbered score on fine screening indicate greater degree of observed disability. A significant correlation of .5036 was observed between the first and second gross screening for the 82 subjects. Thus, it would appear that teachers using the Gross Screening Instrument are just as consistent during the first two weeks of school in screening children as they are several months later after knowing the children better.

B. Fine Screen Results

Two optometrists were involved in the fine screening of subjects for the experimental and control groups. Although similar techniques of testing and identical scoring devices were used, it was to be expected that a difference in the use of the instrument and the scores obtained would be forthcoming.

Following the fine screening of subjects for the program, the children were divided into experimental and control groups using a table of random numbers. The pre-fine screen average score of the experimental group was 280.6 and of the control group, 270.5. This is as shown on Table 4. It is to be noted that there was no statistically significant difference between the average scores of these groups, indicating that the randomization of the groups was successful. Although the experimental group obtained greater gains on an average in the post-test over the pre-test, these gains were not statistically significant.

As mentioned earlier, the two optometrists, although using similar pre-testing and post-testing techniques, were significantly different in their results on the pre-fine screening. This is reported in Table 5. Because of this, it was considered appropriate that the optometrists post-test the same subjects that they had pre-tested on the Fine Screening Instrument. These post-fine screen results are reported in Table 6 and it is noted that there is no statistically significant difference between the means of the two examiners.

Using an analysis of variance of post-fine screening by group and examiner which is reported in Table 7, it can be seen that there is a statistically significant difference between the experimental and control groups. This is significant at the one percent level. Analysis of variance is a statistical treatment of the differences in means. Although the gains, from pre-fine screening to post-fine screening, of the experimental group was not statistically significantly greater than the gains of the control group, the difference of means tested by an analysis of variance between the two groups, experimental and control, was highly significant. This would indicate that the performance following the training procedure of the experimental group on the visual-motor-perceptual testing instrument was significantly better than that of the control group. The analysis of variance between the examiners on the post-fine screening was not significant.

Table 4

SUMMARY OF AVERAGE FINE SCREEN SCORES, PRE AND POST

Group	Average Fine Screen Means		
	Pre	Post	Gain
Experimental	280.6	326.8	46.2 *
Control	270.5	305.1	34.6
Total	275.5	315.8	40.4

* Gains not significant.

Table 5

COMPARISON OF EXPERIMENTAL VS.
CONTROL AND EXAMINER ON PRE-FINE SCREEN

Examiner	Experimental			Control			Total		
	n	Σx	$\bar{x}$	n	Σx	$\bar{x}$	n	Σx	$\bar{x}$
Paley	19	5,065	266.6	27	7,116	263.6	46	12,181	264.8
Lipovsky	22	6,444	292.9	14	3,976	284.8	36	10,420	289.4*
Total	41	11,509	280.6	41	11,092	270.5	82	22,601	275.6

* Significant difference: t = 3.47

Table 6

COMPARISON OF EXPERIMENTAL VS. CONTROL
AND EXAMINER ON POST-FINE SCREEN

Examiner	Experimental			Control			Total		
	n	Σx	$\bar{x}$	n	Σx	$\bar{x}$	n	Σx	$\bar{x}$
Paley	19	6,299	331.5	27	8,303	307.5	46	14,602	317.4*
Lipovsky	21	6,774	322.6	14	4,208	300.6	35	10,982	313.8
Total	40	13,073	326.8	41	12,511	305.1	81	25,584	315.9

* No significant difference.

Table 7

ANALYSIS OF VARIANCE OF POST-FINE SCREEN BY GROUP AND EXAMINER

Source of variation	Degrees of freedom	Sums of squares	Mean square	F
Total	80	65,730.223	--	--
Between cells	3	10,760.173	3,586.724	5.02**
Between groups a/	1	9,515.325	9,515.325	13.33**
Between examiners b/	1	266.746	266.746	.37
Interaction	1	978.102	978.102	1.37
Within cells	77	54,970.050	713.897	--

** Significant at .01 level.
a/ Experimental and Control
b/ Paley and Lipovsky

The average gain in pre- and post-test fine screening by school, by sex, and by grade is reported in Table 8. Clear cut results are not indicated. There was more gain in the experimental groups in the Montebello Road School of first grade boys and girls, and second grade boys than there was in the control group in that school. At the Cypress Road School, however, there were greater gains among first grade boys and girls in the control group than among the experimental group. Whereas, the second grade boys and girls of Cypress Road School experimental group showed greater gains than the control groups of that grade level. At the third grade level, there were greater gains in the control group in the Montebello Road School by boys and girls; whereas, in the Cypress Road School, the experimental group in grade three had greater gains than the control group. There is such an inconsistency here and lack of definite direction that further treatment and analysis of the data appears unnecessary.

C. <u>I.Q. and Achievement Test Results</u>

Results of the Lorge-Thorndike I.Q. Test, Stanford Achievement Test, and Gates-McGinitie Reading Test do not seem to indicate any gains of the experimental group over the control group in the pre- and post-test situation to warrant a careful analysis.

The average grade one scores are reported in Table 9 and it will be noted that in almost all instances the grade level performance on both Gates-McGinitie sub-tests and Stanford sub-tests were higher or the same for the control group as for the experimental group. There were also no significant differences in pre- and post-tests on the Lorge-Thorndike I.Q. Test. A similar situation presents itself on average test scores for grades two and three as reported in Table 10. It will be noted that gains in all or most instances are either similar or not significantly different between the experimental and the control groups. In the case of I.Q. tests, in all instances, the post-test scores were lower than the pre-test scores. Hence, it did not seem advisable to treat the statistics in a more thorough fashion than this.

Table 11 shows average Stanford Median Scores, and here only the second grade experimental girls group gained more than the control group. In all other instances, the control gains were greater than the experimental group gains. Table 12 combines the results of

Table 8

AVERAGE GAIN IN PRE- AND POST-,
FIRO SCREEN

Grade and Sex Group	Montebello		Cypress	
	Exp.	Cont.	Exp.	Cont.
Boys - 1	59.7	38.6	44.8	66.8
Girls - 1	81.3	38.5	40.7	64.7
Boys - 2	41.4	14.4	85.0	33.5
Girls - 2	42.0	52.5	39.0	23.3
Boys - 3	24.8	43.0	40.0	0.6
Girls - 3	35.5	38.5	34.0	27.5

Table 9

AVERAGE GRADE ONE SCORES

Test	Boys		Girls		Total	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Lorge-Thorndike I.Q.(Pre)	110.9	98.9	103.3	98.8	107.4	98.9
Lorge-Throndike I.Q. (Post)	104.9	102.3	103.8	103.0	104.4	102.6
Metropolitan Readiness(Pre)	69.3	64.2	61.8	61.4	65.8	63.2
Gates Vocabulary(Post)	2.0	2.4	2.0	2.2	2.0	2.3
Gates Comprehension(Post)	1.8	2.3	1.8	1.9	1.8	2.1
Stanford Word Meaning(Post)	1.7	2.2	1.9	2.0	1.8	2.1
Stanford Paragraph Meaning(Post)	1.7	2.2	1.7	1.7	1.7	2.0
Stanford Spelling(Post)	1.8	2.6	2.2	2.2	2.0	2.4
Stanford Word Study(Post)	1.8	2.8	2.2	3.0	2.0	2.9
Stanford Vocabulary(Post)	2.3	2.3	2.1	2.0	2.2	2.2
Stanford Median(Post)	1.8	2.3	1.9	2.0	1.9	2.2

Table 10

AVERAGE TEST SCORES,
GRADES TWO AND THREE

Test	Boys		Girls		Total	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Lorge-Thorndike I.Q.(Pre)	101.9	102.9	99.9	96.2	101.3	100.7
Lorge-Throndike I.Q.(Post)	97.6	99.4	91.0	90.1	95.4	96.3
Gates Vocabulary(Pre)	2.5	2.4	2.8	2.6	2.6	2.5
Gates Vocabulary(Post)	3.5	3.0	3.6	3.2	3.6	3.1
Gates Comprehension(Pre)	2.3	2.1	2.3	2.3	2.3	2.2
Gates Comprehension(Post)	3.1	3.0	3.0	2.6	3.0	2.8
Stanford Word Meaning(Pre)	2.5	2.2	2.5	2.4	2.5	2.3
Stanford Word Meaning(Post)	3.2	3.1	2.9	3.0	3.1	3.0
Stanford Paragraph Meaning(Pre)	2.2	2.0	2.1	2.3	2.2	2.1
Stanford Paragraph Meaning(Post)	3.0	2.8	2.8	2.7	3.0	2.8
Stanford Spelling(Pre)	2.5	2.2	2.7	2.6	2.6	2.3
Stanford Spelling(Post)	3.4	3.0	3.4	3.2	3.4	3.0
Stanford Word Study(Pre)	2.4	2.2	2.7	2.4	2.5	2.2
Stanford Word Study(Post)	3.0	2.8	3.2	3.1	3.1	3.0
Stanford Vocabulary(Pre)	2.5	2.5	2.5	2.4	2.5	2.5
Stanford Vocabulary(Post)	3.2	3.1	3.0	3.0	3.1	3.0
Stanford Median(Pre)	2.4	2.1	2.5	2.3	2.4	2.2
Stanford Median(Post)	3.1	3.0	3.0	2.9	3.1	2.9

Table 11

AVERAGE STANFORD MEDIAN

Group		Pre	Post	Gain
B1	Exp.	--	1.77	--
	Cont.	--	2.30	--
G1	Exp.	--	1.95	--
	Cont.	--	2.02	--
B2	Exp.	2.09	2.72	.63
	Cont.	1.77	2.47	.70
G2	Exp.	1.98	2.66	.68
	Cont.	2.06	2.56	.50
B3	Exp.	2.67	3.46	.79
	Cont.	2.52	3.34	.82
G3	Exp.	3.05	3.48	.43
	Cont.	2.65	3.28	.63

Table 12

STANFORD MEDIAN SUMMARY

Group	Grade								
	Second			Third			Both		
	n	$\sum x$	$\bar{x}$	n	$\sum x$	$\bar{x}$	n	$\sum x$	$\bar{x}$
Exp. Pre	13	26.6	2.05	14	38.9	2.78	27	65.5	2.42
Exp. Post	13	35.1	2.70	14	48.5	3.46	27	83.6	3.10
Av. Gain	13	8.5	.65	14	9.6	.68	27	81.1	.67
Cont. Pre	14	26.2	1.87	13	33.3	2.56	27	59.5	2.20
Cont. Post	14	35.0	2.50	13	43.2	3.32	27	78.2	2.90
Av. Gain	14	8.8	.63	13	9.9	.76	27	18.7	.69

boys and girls and grade levels on the Stanford Achievement Test median scores. The mean gain for the second and third grade experimental group was .67 and the gain for the control group was .69. This is indicative of no statistically significant difference.

A similar situation presents itself in Table 13 in which the experimental and control groups are compared at the second and third grade levels on the Gates and Stanford Tests. In five of the eight sub-categories, a greater gain is shown for the experimental group than the control group, but in four of these, the gain is no higher than one-tenth of a grade level which is not a statistically significant gain. Therefore, it would appear as if the achievement tests and reading tests used were not appropriate for measuring outcomes of the experimental program.

D. Anecdotal Records by Classroom Teachers

Although it is recognized that there is a minimum of statistical treatment that can be given to teacher anecdotal records regarding a program of this sort, at the end of the year a questionnaire was administered to the regular classroom teachers of children participating in the project. The questionnaire asked two specific questions as follows:

- Have you noticed any changes in individuals in your class who participated in the Visual-Motor-Perceptual Project? Please be specific and brief.

- General or specific suggestions regarding the project.

Although questionnaires were not received from all teachers, it is to be noted that teachers in Cypress Road School observed an improvement of 12 of the students in the experimental project and in the Montebello Road School improvement was also noted for 12 students. This is a total of 24 in the experimental project in which teachers noted marked improvement in student performance at the conclusion of the experimental program. Teachers noted that there was no improvement in two students in Cypress Road School and four students in the Montebello Road School, or a total of six. Eleven comments were made that the program should continue or be expanded in the future.

Table 13

COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS
(27 SUBJECTS EACH) ON SECOND AND THIRD GRADE
PRE-TEST AND POST-TEST SCORES

Measure	Pre-Test		Post-Test		Gain	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Gates Vocabulary	2.6	2.5	3.6	3.1	1.0	0.6
Gates Comprehension	2.3	2.2	3.0	2.8	0.7	0.6
Stanford Word Meaning	2.5	2.3	3.1	3.0	0.6	0.7
Stanford Para. Meaning	2.2	2.1	3.0	2.8	0.8	0.7
Stanford Spelling	2.6	2.3	3.4	3.0	0.8	0.7
Stanford Word Study	2.5	2.2	3.1	3.0	0.6	0.8
Stanford Language	2.5	2.5	3.1	3.0	0.6	0.5
Stanford Median	2.4	2.2	3.1	2.9	0.7	0.7

Among items which the teachers noted on the questionnaire of areas in which student improvement was observed are the following:

- Coordination
- Writing
- Reading
- Attitudes
- Problem solving
- Poise
- Social adjustment
- Physical control growth
- Self-control
- Attention span
- Ability to conceptualize
- Increase in ability to listen
- Increase in ability to follow directions
- Increase in ability to recognize letters
- Improvement of work habits
- Improvement of ability to copy from chalkboard

IV. DISCUSSION

A. Interpretation of Findings

1. Gross Screening Instrument

The Gross Screening Instrument was found to be a reasonably useful tool, as a gross instrument, for teacher use in the detection of students with possible visual-motor-perceptual handicaps. The Gross Screening Instrument was administered by all teachers in the experimental program two times, once in September and again in December. The teacher results were found to be consistent from one application to the other. The tool is simple to use and easy to administer.

2. Fine Screening

The Fine Screening Instrument and Scoring Criteria is a rather sophisticated procedure which was used by the optometrists in determining visual-motor-perceptual handicaps on the basis of gross screening conducted by teachers. During the pre-experimental application of the fine screening there was found to be a statistically significant difference between the results of the two optometrists. As such, students were post-tested by the

same examiners who did the pre-testing. The post-testing on the fine screening showed no difference in results between the two optometrists.

There were no statistically significant gains between the experimental group and the control group on the results of the fine screening; although there was a slightly greater gain in the experimental group over the control group. However, on the post-test, there was a significant difference in means between the experimental group and the control group. The mean scores of the experimental group were significantly higher than those of the control group. In the pre-test situation, there was no statistically significant difference in means between the control group and the experimental group. This would indicate that as a result of the visual-motor-perceptual training there was more improvement shown by the experimental group than the control group.

3. Intelligence, Reading, and Achievement Tests

There was no significant difference in gains between the control group and the experimental group on the Lorge-Thorndike I.Q. Test, the Gates-McGinitie Reading Test, and the Stanford Achievement Test. The hypothesis of the project was that there would be gains in achievement of the experimental group over the control group. Some of the reasons for there not being gains might be explained as follows:

a. The experimental period was of short duration. Confined to a single school year, there was need in the project for a large block of time at the beginning of the school year and at the end of the school year for pre- and post-testing. The experimental program did not begin until November 24, 1969 and terminated on May 14, 1970. This permitted only 100 days of actual experimental time. Since training was provided for each student one-half hour per day, this amounted to a total time of 50 hours per student. In addition, there was some loss of instructional time by students due to illness.

b. It was noted throughout the project that there were several contaminating factors and variables which may have detracted from the final results. Among these are the following:

- o Some students, at least two, in the control group were placed on medication by their family physicians for hyperactivity during the experimental period. It was noted that this improved the performance of these students in the control group. It was a variable over which the experimental project had no control.

- o There were variations in the control of the students in the project regarding special instruction. Special instruction is given in the areas of speech therapy, reading, and other remedial areas. It is to be noted that some of the students in both the experimental and control groups participated in this extra help in varying amounts as part of their regularly prescribed program. At the outset, it was recognized that it was impossible to control all variables so no attempt was made to deprive students in the project of instruction which they otherwise might receive.

- o Although retarded students in special education programs were excluded from the project, it was noted following selection of the experimental population that some students had emotional and psychological difficulties which were not accounted for in the program.

c. The emphasis in the experimental project was primarily a physical emphasis including fine motor, gross motor, eye-hand coordination and so on. The testing program, except relating to the fine screening, did not directly measure facets for which training was being given.

d. It is expected that there may well be latent effects in this experiment and that in following months, it is possible that there may be gains in the experimental population on the achievement and reading tests. How extensive

these gains might be is questionable however, in view of the fact that post-test gains were negligible.

B. Implications and Recommendations

It is considered that the project was a success and that there were improvements shown in students participating in the experimental program. The visual training teacher noted great improvement in most of the students and classroom teachers have verified this in their anecdotal reports.

It is felt that perhaps the achievement and reading test instruments used to measure the success of the program were ill suited for the training. It is thought that there is a need for examining the possibility of an instrument which would fall somewhere in between the items on the Fine Screening Instrument and the achievement tests and reading tests. Tests to show gains in achievement on the basis of participation in a visual-motor-perceptual training program should be more related to the mental processes being trained in the project.

It is recommended that visual-motor-perceptual programs continue in our school district in a variety of different settings. It is expected that a great deal can be done by the regular classroom teachers and by physical education teachers in assisting students in this development. In addition, special professional personnel such as reading teachers, helping teachers, psychologists and others, with the assistance of consultant personnel, would deal with more specific problem areas in children with visual-motor-perceptual handicaps. During the Summer of 1970, development of an experimental program manual for teacher use and inservice education in this school district is contemplated.

V. SUMMARY

A. Statement of the Problem

Clinical evidence has pointed to the importance of visual, motor and perceptual bases for academic achievement and the relationship between deficiencies in these areas and underachievement. The use of methods and techniques for correction and development of visual, motor and perceptual difficulties within a school setting

may alleviate underachievement difficulties and assist in overcoming the need for much of the remedial and compensatory training in schools today.

The major purpose and hypothesis of this experimental project was to determine the extent to which visual, motor and perceptual training would improve the reading and general achievement of primary level children with visual, motor and perceptual deficiencies.

B. Methods Used

Eighty children of two schools in first, second and third grades were identified as having visual-motor-perceptual handicaps which may be affecting their academic performance. They were identified using a Gross Screening Instrument of 16 checklist items filled out by classroom teachers, and by a Fine Screening Instrument used by optometric consultants. The 80 children were randomly placed into experimental and control groups. Pre-testing consisted of the Lorge-Thorndike I.Q. Test for all grades, the Metropolitan Readiness Test for grade 1, and the Gates-McGinitie Reading Test and Stanford Achievement Test for grades 2 and 3.

In each of the schools, three training groups were established made up of six to eight children each. Training took place for six months, from November, 1969 to May, 1970. The groups met daily for one-half hour periods. Exercises and activities varied according to the individual deficiency and progressed from simple to more sophisticated variations. Training exercises and activities can be divided into six major categories as follows: ocular motor; movement skills, including balance, one-sided movement, alternate movement, and reciprocal movement; laterality and directionality; spatial judgments; eye-hand coordination; and, visualization.

Post-testing was completed at all three grade levels using Fine Screening, Lorge-Thorndike I.Q. Test, Gates-McGinitie Reading Test, and the Stanford Achievement Test.

C. Results Obtained

1. Gross Screen Analysis

An item analysis using a t-Test and biserial correlation was conducted on the results of the Gross Screening Instrument. Although all items

contributed significantly to the total score, some of the items were more important than others. There was a significant correlation between results of the Gross Screening Instrument and Fine Screening Instrument.

2. Fine Screen Analysis

There was found to be no significant difference between the experimental and control groups on the basis of pre-fine screening. The post-fine screening mean score of the experimental group was significantly higher at the .01 level than the mean score of the control group, using analysis of variance. Although the gains of the experimental group were greater than the control group from pre- to post-fine screening, these gains were not found to be significant. Clear cut differences by grade level and sex were not indicated.

3. I.Q. and Achievement Test Results

Results of the Lorge-Thorndike I.Q. Test, Stanford Achievement Test, and Gates-McGinitie Reading Test do not indicate any gains of the experimental group over the control group. It would appear that the achievement tests and reading tests used were not appropriate for measuring the experimental program.

4. Anecdotal Records by Classroom Teachers

Almost all classroom teachers who had children participating in the experimental group of the project felt that their students made remarkable progress as a result of the program. This was ascertained by a questionnaire administered to teachers at the conclusion of the project.

D. Discussion

The Gross Screening Instrument was found to be a useful tool for teacher use in the detection of students with possible visual-motor-perceptual handicaps. It is simple to use and easy to administer. On the basis of fine screening results more improvement was shown in visual-motor-perceptual functioning by the experimental group than by the control group.

The lack of gains on I.Q. and achievement tests between the experimental group and the control group may be due to several factors. The experimental period was of short duration and training was for only one-half hour per day. There were variations in the control of students in the project in special areas of instruction. The training emphasis in the experimental project was primarily physical in nature. The testing program, except relating to the fine screening, did not directly measure facets for which training was being given.

It is considered that the project was a success and that there were improvements shown in students participating in the experimental program. It is recommended that visual-motor-perceptual programs continue in our school district in a variety of different settings.

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VII. APPENDIXES

A. Sample Visual-Motor-Perceptual Training Activities

B. Gross Screening Instrument

C. Class Visual Screening Summary

D. Optometric Examination Scoring Sheet

E. Optometric Tests and Scoring Criteria

F. Frequency Distribution of Negative Scores on Gross Screening Instrument -- September 30, 1969

1. Cypress Road School
2. Montebello Road School
3. Cypress Road and Montebello Road Schools

G. Negative Score Item Frequency on Gross Screening Instrument -- September 30, 1969

1. Cypress Road School
2. Montebello Road School
3. Cypress Road and Montebello Road Schools

H. Frequency Distribution of Negative Scores on Gross Screening Instrument -- February 1, 1970

1. Cypress Road School
2. Montebello Road School
3. Cypress Road and Montebello Road Schools

I. Negative Score Item Frequency on Gross Screening Instrument -- February 1, 1970

1. Cypress Road School
2. Montebello Road School
3. Cypress Road and Montebello Road Schools

APPENDIX A

A. Sample Visual-Motor-Perceptual Training Activities

1. Ocular-Motor Activity -- Marsden Ball

a. Objectives

- To train the eyes to follow an object through space, while involving figure-ground interpretation.

b. Procedure

In the area of ocular-motor control, the Marsden Ball is primarily used for pursuit work. Pursuit is the ability to visually follow an object through space as it moves. In the case of the Marsden Ball, the subject remains stationary as the Marsden Ball is moved either back and forth or in circles and the subject's eye moves accordingly. Progress is noted by observing the movement of the subjects eye while pursuing the Marsden Ball. Left and right ducking movements are also used with the Marsden Ball.

NOTE: The Marsden Ball is a small plastic ball about three inches in diameter. It is suspended on a string from a rod or the ceiling, so that a free swing can be maintained. The ball should be about chest high on the child, therefore adjustment should be made for the individual.

2. Movement Skills (Balance) -- Walking Beam

a. Objectives

- To develop skills in maintaining dynamic balance.
- To promote controlled movement of the body through space.
- To teach laterality and directionality.

b. Procedures

In this project a special walking beam was used which had a two-by-four in the middle. On each side of the two-by-four beam was an inclined platform of about five inches in width. Activities using this walking beam included: walking on the platforms on either side of the two-by-four beam; walking down the right platform placing one foot in front of the other in a heel to toe fashion, done using a very slow and distinct step; criss-cross walking with left foot on the right platform and right foot on the left platform; walking backwards using all of the previously mentioned variations; focusing of attention by the subject on a distant object such as a Marsden Ball or a spot on the wall using the previous variations; throwing and receiving a ball while walking on the walking beam.

3. Movement Skills (Bilateral Movement) -- Windshield Wipers

a. Objectives

- To develop skills in bilateral movement.
- To train eyes to focus on a central point with peripheral visual scanning.

b. Procedure

Under bilateral activities only symmetrical windshield wipers were used. Symmetrical is defined as a body movement where movement on the right side is a mirror image of movement on the left side. With the student's eyes focused at a single point on the blackboard, he moves his hands, containing chalk, to the right and the left of this focal point, using his right hand and left hand respectively. The basic exercise has the right point and the left point an equal distant from the central focus. Variations of this include the outward points at varying distances from the focal point or above or below the horizontal axis. Another variation would be to use a chalkboard clock and to have the student move from the center of the clock to numbers, as directed. The metronome is used in these activities for the purpose of maintaining rhythm.

4. Movement Skills (One-sided Movement) -- One-Sided Blackboard Movement

a. Objectives

- To develop skills in symbol reading.
- To promote left to right eye movement.
- To develop ability in the interpretation of body parts as related to space.

b. Procedure

Blackboard symbols to indicate various body movements, such as hand-on-head, hand-on-shoulders, hand-on-waist, hand-on-knees and hand-on-feet, are used for either the right side or the left side, as may be necessary. The student performs as indicated by the teacher who points to the blackboard symbols. Any variation in symbols or movement required may be used providing only one side of the body is used at a particular time.

5. Movement Skills (Alternate Movement) -- Jumping Jacks

a. Objectives

- To develop skills related to bilaterality in training one side of the body to move in one direction and the other in the opposite direction.
- To develop auditory discrimination and interpretation of a distinct pattern.

b. Procedure

As in regular jumping jacks, there are four counts. On the count of one, the right hand is raised; on the count of two, the left arm is raised; on the count of three, the right arm is lowered; on the count of four, the left arm is lowered. The same foot movements found in the standard jumping jack is used for this activity.

6. Movement Skills (Reciprocal Movement) -- Teams

a. Objectives

- To develop skills in maintaining rhythm in a pattern.

- To promote ability in body movement in a reciprocal fashion.

b. Procedure

In this exercise, the right hand taps the right knee, the left hand the left knee, the left foot taps the floor, then the right foot taps the floor. A continuous pattern is set up and maintained. Speed of this activity depends on the ability of the children involved.

7. Laterality and Directionality -- Lines in Eight Directions

a. Objectives

- To develop ability to distinguish between directions.
- To promote skills in listening and following directions.
- To teach the names and directions of different lines.

b. Procedure

Using a central point students are directed to draw lines in eight directions from this point. These include left, right, up, down, up-left, up-right, down-left, and down-right. They must also label these lines with the proper direction. Variations include lines and arrows which change direction at various points.

8. Spatial Judgment -- Parquetry Routine

a. Objectives

- To learn form identity regardless of orientation in space.
- To perceive that form quality remains the same despite variation in color and size.
- To develop the concept of part-whole.

b. Procedure

Parquetry blocks are available in different sizes. The small parquetry blocks are flat wooden pieces made in different geometric forms and of different colors. Cards including various patterns accompany these blocks. These patterns are progressively more difficult. The child is asked to complete a specific geometric form using the blocks on the parquetry pattern. They must use the correct blocks and the proper color to complete these patterns.

9. Eye-Hand Coordination -- Rotating Peg Board

a. Objectives

- To develop skills in eye-hand coordination.
- To promote ability in distinguishing between colors and form.
- To develop coordination for placing an object on a moving target.

b. Procedure

The instrument used for this exercise consists of a circular peg board fastened to an electrical rotator. The peg board has individual rows of colors--red, white, blue and yellow. There are several exercises which vary in level of difficulty. The most elementary exercise is tipping the peg board and directing the child to match the colored pegs with the rows of colors. As the child progresses, this is made more difficult by placing the peg board flat on the table as it rotates. Also small ping pong balls can be placed on the pegs as the disc rotates. Next the student can be asked to make geometric forms, such as a circle, square or rectangle by outlining these forms with the pegs. Other variations can be used.

10. Visualization -- Flash-X

a. Objectives

- To promote optimal efficiency in ability to recall objects seen at reduced exposure time.

- To reinforce readiness, numbers and letters in varying levels of difficulty.

b. Procedure

A commercial tachistoscope is used. This consists of a round instrument with a mechanism flashing open a window at a speed of 1/25 of a second. A card is inserted in the flash-x mechanism and as the instrument is flashed a window reveals a small object to be seen by the child. To check his response, he may hold the window open. The speed of the shutter is fast enough so that considerable concentration is necessary to accomplish visualization. This card can be turned to different figures which are pictures, numbers, letters and combinations thereof. Other kinds of cards contain readiness pictures, single letters, sequenced letters, single numbers, sequenced numbers, more advanced vocabulary, and math.

Appendix B

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York
--
GROSS SCREENING INSTRUMENT

September 1, 1969

This instrument is to be completed by each classroom teacher of grades 1, 2, and 3 in the Cypress Road and Montebello Road Schools for each student. This is the first phase in the "Visual-Motor-Perceptual Training" research project and is intended to initially screen students who may have visual problems related to learning. Following this initial screening, the optometric consultants will conduct fine testing procedures.

Each student should be marked with a +, 0, or - in each of the 16 items as follows:

+ Student performs or exhibits item satisfactorily.
0 Positive or negative performance on item not noticed, or no opportunity to observe.
- Student does not perform or exhibit item satisfactorily.

Item (Please check appropriate column)	+	0	-
The student:			
1. exhibits a positive attitude toward school.			
2. exhibits acceptable classroom behavior.			
3. does not exhibit, in general, immature behavior.			
4. is generally well coordinated.			
5. exhibits acceptable ability to follow instructions.			
6. exhibits acceptable performance with pencil, crayons, scissors.			
7. exhibits acceptable performance at block play.			
8. has no difficulty in distinguishing objects, letters, pictures, etc. that are similar but have different elements, shapes or orientation.			
9. has no difficulty copying from the chalkboard.			
10. exhibits no tendency to close or cover one eye.			
11. can maintain balance on either foot for a minimum of 10 seconds.			
12. can hop on either foot for a minimum of 5 hops.			
13. can skip across the room.			
14. exhibits no tendency to turn or twist body on paper and pencil tasks.			
15. exhibits no tendence to twist paper on paper tasks.			
16. always uses same hand (chalkboard, pencil, throwing, etc.).			
Total Number			

Adapted by:
Jerome Lipovsky, O.D.
Bernard Paley, O.D.

Name of Student_____

Teacher_____

Grade_____

School_____

Appendix C

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

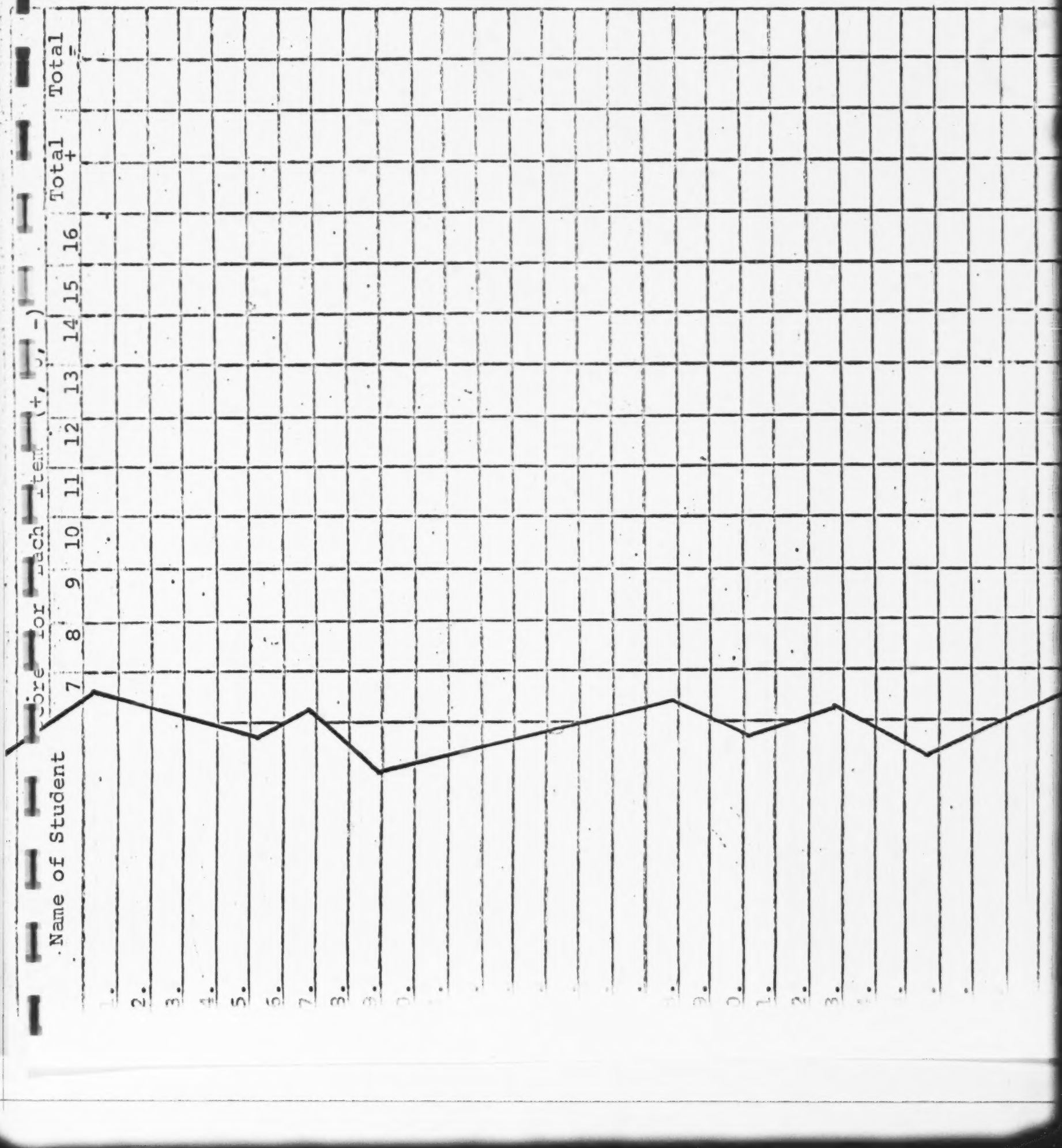
September 1, 1969

CLASS
VISUAL SCREENING SUMMARY

Teacher_____

Grade_____

School_____



Appendix D

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

OPTOMETRIC EXAMINATION
SCORING SHEET

Student _____

School _____

Grade _____ Teacher _____

Date of Examination _____

Examination Item	Score			
	Unrelated 1 2 3	Unorganized 4 5 6	Immature 7 8 9	Integrated 10 11 12
I. OCULOMOTOR SKILLS				
*IV B Pursuits: quality of movement				
IV C Pursuits: visual motor heirarchy				
V B Saccadics: quality of movement				
V C Saccadics: visual motor heirarchy				
VI A Convergence: quality of movement				
VI B Convergence: near point of convergence				
II. OCULAR FUNCTION				
XII A Vectograph Stereo awareness				
XIII A Accommodation				
III. VISUAL JUDGEMENTS				
I B Circus puzzle: matching skills (size)				
I C Circus puzzle: matching skills (form)				
I D Circus puzzle: visual motor heirarchy				
II B Pegboard: matching skills (size)				
II C Pegboard: matching skills (form)				

Adapted by:
Jerome Lipovsky, O.D.
Bernard Paley, O.D.

* Test Number Key. See supplementary explanation.

OPTOMETRIC EXAMINATION SCORING SHEET (continued)

Examination Item	Score			
	Unrelated 1 2 3	Unorganized 4 5 6	Immature 7 8 9	Integrated 10 11 12
II D Pegboard: visual motor heirarchy				
III B Copy forms: matching skills (size)				
III C Copy forms: matching skills (form)				
III D Copy forms: visual motor heirarchy				
IV BILATERAL SKILLS I A Circus puzzle: bilateral integration				
II A Pegboard: bilateral integration				
III A Copy forms: bilateral integration				
IV A Pursuits: bilateral integration				
V A Saccadics: bilateral integration				
VII B Angels: overal integration				
VIII A Chalkboard circles: bilateral equality				
VIII B Chalkboard circles: bilateral integration				
IX A Scissors jump: bilateral integration				
X A Monocular prism: bilateral equality				
V SPATIAL AWARENESS AND ORGANIZATION II E Pegboard: visual reversals				
II F Pegboard: organization				
III E Copy forms: organization				
VII A Angels: awareness of parts				
VII C Angels: control of movement				
VIII C Chalkboard circles: organization				
X B Monocular prism: organization				
XI A Movement in space				

Appendix E

Ramapo Central School District No. 1
Suffern, New York

OPTOMETRIC TESTS AND SCORING CRITERIA

The thirteen tests outlined below are to be used in the fine optometric screening of students. A student is to be scored on each of the items using a scale from 1 to 12, 1 being the poorest performance and 12 best performance. Scores on test items can be transferred to the Optometric Examination Scoring Sheet which categorizes items by area of deficiency.

I. CIRCUS PUZZLE

A.	Bilateral Integration- Criteria:	Relationship between the hands during piece placement.
B.	Matching Skills (size)-Criteria:	Ability to match size of pieces with the openings.
C.	Matching Skills (form)-Criteria:	Ability to match form of pieces with the openings.
D.	Visual-motor heirarchy-Criteria:	Relative degree of visual and tactile cues during piece placement.

II. PEGBOARD FORMS

A.	Bilateral Integration -Criteria:	Relationship between the hands during peg placement.
B.	Matching Skills (size)-Criteria:	Ability to use correct number of pegs.
C.	Matching Skills (form)-Criteria:	Success with which peg configurations are duplicated.
D.	Visual-motor heirarchy-Criteria:	Relative degree of visual and tactile cues during peg placement.
E.	Visual reversals -Criteria:	Ability to reverse forms correctly.
F.	Organization -Criteria:	Sequence in which individual pegs are placed during reproduction of form.

III. COPY FORMS

A.	Bilateral Integration -Criteria:	Relationship between the hands while handling pencil and paper.
B.	Matching skills (size)-Criteria:	Relative size of the various form reproductions.
C.	Matching skills (form)-Criteria:	Degree of accuracy in reproducing the forms.
D.	Visual motor heirarchy-Criteria:	Ability to accurately reproduce direction without body movement or paper rotation.
E.	Organization -Criteria:	Sequence in which forms are placed on paper.

IV. PURSUITS

A. Bilateral integration	-Criteria:	Comparison of the ocular movements of the right and left eyes.
B. Quality of movement	-Criteria:	Smoothness and fluidity of ocular movements during the task. Such observations as saccadic movement, over and/or undershooting lower the score.
C. Visual motor heirarchy	-Criteria:	Ability to move the eyes independently of the head and body.

V. SACCADICS

A. Bilateral integration	-Criteria:	Comparison of the ocular movements of the right and left eyes.
B. Quality of movement	-Criteria:	Accuracy with which the eyes pick up the target to be fixated.
C. Visual motor heirarchy	-Criteria:	Ability to move the eyes independently of the head and body.

VI. CONVERGENCE

A. Quality of movement	-Criteria:	Ability to maintain binocular fixation on the target as it approaches and the ability to visually release and regrasp target when it is close to the limit of convergence range.
B. Near point of convergence-	"	Magnitude of the near point of convergence.

VII. ANGELS

A. Awareness of parts	-Criteria:	Ability to move only those parts touched.
B. Overall integration	-Criteria:	Degree to which movements involving two arms, two legs, one arm and one leg are simultaneous.
C. Control of movement	-Criteria:	Accuracy of final placement of body part(s) touched.

VIII. CHALKBOARD CIRCLES

A. Bilateral equality	-Criteria:	Comparison of performance between right and left hands.
B. Bilateral integration	-Criteria:	Ability to maintain both symmetrical and reciprocal circles.
C. Organization	-Criteria:	Ability to change direction of circles on verbal command.

IX. SCISSORS JUMP

A. Bilateral integration	-Criteria:	Ability to change position of arms and legs simultaneously in both homolateral and cross-pattern jump.

X. MONOCULAR PRISM

A. Bilateral equality -Criteria: Comparison of performance with right and left eyes.

B. Organization -Criteria: Ability to correctly identify direction of target movement.

XI. MOVEMENT IN SPACE

A. Criteria: Ability of subject to properly place himself in relation to examiner upon verbal instructions.

XII. VECTOGRAPH

A. Stereo awareness -Criteria: Proper appreciation of SILO and parallax.

XIII. ACCOMMODATION

A. Criteria: Time required to clear +2.00 to -2.00 to +2.00 binocularly on a near point target.

Appendix F

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Frequency Distribution of Negative Scores on
Gross Screening Instrument
--
CYPRESS ROAD SCHOOL

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16										
15										
14										
13	1		1							1
12										
11				1		1				1
10	1		1	1		1				2
9				3		3	1		1	4
8	1	1	2					1	1	3
7	3	1	4	4	1	5	1		1	10
6		1	1	1	1	2	1		1	4
5	5	4	9	4		4	4	1	5	18
4	7	2	9	5	2	7	3		3	19
3	8	3	11	6	6	12	5	2	7	30
2	8	6	14	6	7	13	3	2	5	32
1	10	9	19	11	12	23	9	5	14	56
0	16	35	51	20	24	44	26	41	67	162
TOTAL	60	62	122	62	53	115	53	52	105	342

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Frequency Distribution of Negative Scores on
Gross Screening Instrument
--
MONTEBELLO ROAD SCHOOL

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16							1		1	1
15										
14	1		1				2		2	3
13		1	1				1		1	2
12							2		2	2
11	2		2	1		1				3
10				2		2	1	1	2	4
9				1		1	3	1	4	5
8		1	1		1	1		1	1	3
7				2	1	3	1		1	4
6	2	1	3	2	1	3	4		4	10
5	1		1	6	2	8	2		2	11
4	2	2	4	4	2	6	3	2	5	15
3	7		7	6	6	12	5	2	7	26
2	8		8	3	5	8	8	3	11	27
1	14	3	17	13	5	18	3	9	12	47
0	23	38	61	9	29	38	15	41	56	155
TOTAL	60	46	106	49	52	101	51	60	111	318

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Frequency Distribution of Negative Scores on
Gross Screening Instrument
--
MONTEBELLO AND CYPRESS ROAD SCHOOLS

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTA
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16							1		1	1
15										
14	1		1				2		2	3
13	1	1	2				1		1	3
12							2		2	2
11	2		2	2		2				4
10	1		1	3		3	1	1	2	6
9				4		4	4	1	5	9
8	1	2	3		1	1		2	2	6
7	3	1	4	6	2	8	2		2	14
6	2	2	4	3	2	5	5		5	14
5	6	4	10	10	2	12	6	1	7	29
4	9	4	13	9	4	13	6	2	8	34
3	15	3	18	12	12	24	10	4	14	56
2	16	6	22	9	12	21	11	5	16	59
1	24	12	36	24	17	41	12	14	26	103
0	39	73	112	29	53	82	41	82	123	317
TOTAL	120	108	228	111	105	216	104	112	216	660

Appendix G

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Negative Score Item Frequency on
Gross Screening Instrument
--
CYPRESS ROAD SCHOOL

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	2	2	4	5	5	10	2		2	16
15	3	3	6	1	2	3	3		3	12
14	5	4	9	3	1	4	2	1	3	16
13	13	7	20	19	4	23	13	4	17	60
12	4	1	5	16	4	20	4		4	29
11	5		5	14	6	20	7	2	9	34
10	5	2	7	4	1	5				12
9	15	11	26	18	6	24	2	1	3	53
8	11	11	22	5	4	9	3	1	4	35
7	3	1	4	1		1				5
6	5		5	9	3	12	6	2	8	25
5	17	12	29	14	8	22	12	3	15	66
4	11	2	13	14	4	18	7	2	9	40
3	21	7	28	18	9	27	6	5	11	66
2	20	9	29	12	5	17	11	5	16	62
1	13	7	20	10		10	4	3	7	37
TOTAL	153	79	232	163	62	225	82	29	111	568

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Negative Score Item Frequency on
Gross Screening Instrument
--
MONTEBELLO ROAD SCHOOL

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	1		1				7		7	8
15	7	2	9	8	7	15	11	2	13	37
14	6	3	9	10	6	16	11	3	14	39
13	15	2	17	19	2	21	10	1	11	49
12	6	1	7	14	1	15	6		6	28
11	10	2	12	8		8	9		9	29
10	2		2	3	2	5	3	1	4	11
9	5	4	9	12	8	20	11	3	14	43
8	8	5	13	18	9	27	17	5	22	62
7		2	2	1	1	2	7		7	11
6	6	6	12	8	1	9	16	3	19	40
5	9	6	15	15	11	26	25	11	36	77
4	6	2	8	12	1	13	17	3	20	41
3	14	4	18	19	10	29	25	7	32	79
2	8	3	11	8	8	16	18	9	27	54
1	6	1	7	4	3	7	11	3	14	28
TOTAL	109	43	152	159	70	229	204	51	255	636

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

September 30, 1969

Negative Score Item Frequency on
Gross Screening Instrument
--
CYPRESS AND MONTEBELLO ROAD SCHOOLS

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	3	2	5	5	5	10	9		9	24
15	10	5	15	9	9	18	14	2	16	49
14	11	7	18	13	7	20	13	4	17	55
13	28	9	37	38	6	44	23	5	28	109
12	10	2	12	30	5	35	10		10	57
11	15	2	17	22	6	28	16	2	18	63
10	7	2	9	7	3	10	3	1	4	23
9	20	15	35	30	14	44	13	4	17	96
8	19	16	35	23	13	36	20	6	26	97
7	3	3	6	2	1	3	7		7	16
6	11	6	17	17	4	21	22	5	27	65
5	26	18	44	29	19	48	37	14	51	143
4	17	4	21	26	5	31	24	5	29	81
3	35	11	46	37	19	56	31	12	43	145
2	28	12	40	20	13	33	29	14	43	116
1	19	8	27	14	3	17	15	6	21	65
TOTAL	262	122	384	322	132	454	286	80	366	1174

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Frequency Distribution of Negative Scores on
Gross Screening Instrument
--
CYPRESS ROAD SCHOOL

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16										
15										
14				1		1				1
13	2		2							2
12	2		2							2
11	1		1							1
10	1		1	5	1	6		1	1	8
9							1		1	1
8		2	2	1	1	2				4
7	1		1	1	1	2	1		1	4
6	4	1	5	2	1	3	2		2	10
5	3	2	5	4	2	6	2		2	13
4	2	4	6	4		4	5	1	6	16
3	3	2	5		4	4	2	3	5	14
2	7	5	12	4	1	5	1	3	4	21
1	11	8	19	8	8	16	17	5	22	57
0	29	35	64	30	40	70	24	38	62	196
TOTAL	66	59	125	60	59	119	55	51	106	350

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Frequency Distribution of Negative Scores on
Gross Screening Instrument
--
MONTEBELLO ROAD SCHOOL

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16										
15							1		1	1
14										
13										
12		1	1							1
11										
10							1		1	1
9	1		1	1		1	3		3	5
8		1	1	1		1	1	1	2	4
7		1	1	3	1	4	2		2	7
6	2	1	3	3		3	3		3	9
5	3	2	5	3	1	4	2	1	3	12
4	6	3	9	5	4	9	1	1	2	20
3	1	1	2	6	5	11	5	2	7	20
2	5	3	8	7	5	12	3		3	23
1	8	1	9	11	4	15	6	5	11	35
0	33	34	67	10	31	41	22	47	69	177
TOTAL	59	48	107	50	51	101	50	57	107	315

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Frequency Distribution of Negative Scores on Gross Screening Instrument -- CYPRESS AND MONTEBELLO ROAD SCHOOLS

Number of Negative Scores	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16										
15							1		1	1
14				1		1				1
13	2		2							2
12	2	1	3							3
11	1		1							1
10	1		1	5	1	6	1	1	2	9
9	1		1	1		1	4		4	6
8		3	3	2	1	3	1	1	2	8
7	1	1	2	4	2	6	3		3	11
6	6	2	8	5	1	6	5		5	19
5	6	4	10	7	3	10	4	1	5	25
4	8	7	15	9	4	13	6	2	8	36
3	4	3	7	6	9	15	7	5	12	34
2	12	8	20	11	6	17	4	3	7	35
1	19	9	28	19	12	31	23	10	33	92
0	62	69	131	40	71	111	46	85	131	373
TOTAL	125	107	232	110	110	220	105	108	213	665

Appendix I

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Negative Score Item Frequency on
Gross Screening Instrument
--
CYPRESS ROAD SCHOOL

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	1	1	2	3	2	5	2	2	4	11
15	8	1	9	4	3	7	5	2	7	23
14	8	4	12	8	2	10	5	2	7	29
13	18	2	20	10	3	13	18	1	19	52
12	4	1	5	5	2	7		1	1	13
11	8	4	12	11	3	14	5	2	7	33
10	11	5	16	5	2	7	3		3	26
9	19	11	30	14	4	18		2	2	50
8	19	15	34	10	5	15	4	2	6	55
7				1	1	2				2
6	9	5	14	12	4	16	6	4	10	40
5	13	11	24	11	10	21	7	5	12	57
4	11	2	13	15	5	20	9	2	11	44
3	12	6	18	9	7	16	5	3	8	42
2	10	1	11	14	6	20	7	3	10	41
1	8	3	11	11	4	15	7	3	10	36
TOTAL	159	72	231	143	63	206	83	34	117	554

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Negative Score Item Frequency on
Gross Screening Instrument
--
MONTEBELLO ROAD SCHOOL

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	2	1	3				1		1	4
15	6	6	12	4	3	7	9	1	10	29
14	8	8	16	7	4	11	8		8	35
13	8	1	9	13	1	14	8		8	31
12	6	3	9	10	1	11	4	1	5	25
11	6	2	8	10	3	13	4	1	5	26
10	1	1	2	4	1	5	1	1	2	9
9	11	6	17	13	5	18	9		9	44
8	6	8	14	16	10	26	8	3	11	51
7	1	2	3				5		5	8
6	6	7	13	8	2	10	7	4	11	34
5	5	7	12	11	9	20	14	2	16	48
4	3	4	7	10	1	11	16	4	20	38
3	6	5	11	21	11	32	16	4	20	63
2	5	3	8	4	4	8	16	3	19	35
1	1	1	2	3	2	5	8	3	11	18
TOTAL	81	65	146	134	57	191	134	27	161	498

RAMAPO CENTRAL SCHOOL DISTRICT NO. 1
Suffern, New York

February 1, 1970

Negative Score Item Frequency on
Gross Screening Instrument
--
CYPRESS AND MONTEBELLO ROAD SCHOOLS

Number of Item	First Grade			Second Grade			Third Grade			TOTAL
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	
16	3	2	5	3	2	5	3	2	5	15
15	14	7	21	8	6	14	14	3	17	52
14	16	12	28	15	6	21	13	2	15	64
13	26	3	29	23	4	27	26	1	27	83
12	10	4	14	15	3	18	4	2	6	38
11	14	6	20	21	6	27	9	3	12	59
10	12	6	18	9	3	12	4	1	5	35
9	30	17	47	27	9	36	9	2	11	94
8	25	23	48	26	15	41	12	5	17	106
7	1	2	3	1	1	2	5		5	10
6	15	12	27	20	6	26	13	8	21	74
5	18	18	36	22	19	41	21	7	28	105
4	14	6	20	25	6	31	25	6	31	82
3	18	11	29	30	18	48	21	7	28	105
2	15	4	19	18	10	28	23	6	29	76
1	9	4	13	14	6	20	15	6	21	54
TOTAL	240	137	377	277	120	397	217	61	278	1,052